DAMPING AND MUFFLING STRUCTURE FOR EL CELL

BACKGROUND OF THE INVENTION

The present invention is related to a damping and muffling structure for EL cell, and more particularly to a damping and muffling structure that is able to minify or even eliminate the vibration and noise caused by electromagnetic interference effect (abbreviated into EMI effect hereafter) created by A.C. electric field.

The conventional electroluminescent cell (EL cell) is a thin sheet and mainly used as backlight cell of PDA, mobile phone, etc. Fig. 6 shows a conventional EL cell composed of a transparent substrate 81, a front electrode layer 82, a lighting layer 83, an inducing layer 84, a back electrode layer 85 and an insulating layer 86. By means of a driving circuit, an AC voltage is applied to the front and back electrode layers 82, 85 to make the lighting layer 83 emit light.

When AC electric field acts on the inducing layer 84, due to electromagnetic interference effect, the charge will accumulate on the inducing layer 84 to create surface energy conservation effect. The surface energy conservation effect will make the charge uneven distribute on the inducing layer 84 and create piezoelectric effect. The piezoelectric effect will lead to vibration of the EL cell to emit noise. This affects the quality of the EL cell or even interferes with the drive of the LCD module.

In order to solve the problems of vibration and noise of the

conventional EL cell caused by AC electric field, generally the EL cell is backed to increase the thickness thereof so as to minify the vibration and noise. Alternatively, the EL cell is tightly attached to the circuit board to reduce vibration and noise.

However, the EL cell applied to small-size electronic products such as mobile phones is limited in thickness specification. Therefore, the backing will lead to excessive thickness. On the other hand, the EL cell can be attached to the circuit board to reduce over 60% noise. However, it is difficult to assemble the module and the use of double-face tape will lead to increased cost.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to provide a damping and muffling structure for EL cell. The damping and muffling structure includes a conductive member, which can quickly conduct the charge accumulating on the inducing layer to a grounding electrode so as to minify or even eliminate the vibration and noise caused by AC electric field.

According to the above object, the damping and muffling structure for EL cell includes a transparent substrate, a front electrode layer, a lighting layer, an inducing layer, a back electrode layer and an insulating layer for packaging the EL cell. The front electrode layer, lighting layer, inducing layer, back electrode layer and insulating layer are sequentially overlaid on the substrate. A conductive layer is laid between the lighting layer and the inducing layer. The front and back electrode layers and the

conductive layer are connected to a driving circuit having a grounding electrode. The conductive layer is connected to the grounding electrode of the driving circuit, whereby the conductive layer can conduct the charge accumulating on the inducing layer so as to minify or even eliminate the vibration and noise caused by AC electric field.

The present invention can be best understood through the following description and accompanying drawings wherein:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a top view of a first embodiment of the EL cell of the present invention, showing that the conductive layer is connected to the grounding electrode;

Fig. 2 is a sectional view taken along line 2-2 of Fig. 1;

Fig. 3 is a sectional view taken along line 3-3 of Fig. 1;

Fig. 4 is a plane view showing the structure of a second embodiment of the present invention;

Fig. 5 is a plane view showing the structure of a third embodiment of the present invention; and

Fig. 6 is a sectional view of a conventional EL cell.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Please refer to Figs. 1 to 3. The damping and muffling structure for EL cell of the present invention includes a transparent substrate 11, a transparent front electrode layer 12 (which in this embodiment is an ITO bus-bar), a lighting layer 13 composed of numerous lighting particles, an inducing layer 14, a back electrode layer 15 and an insulating layer 16 for

packaging the EL cell. The transparent front electrode layer 12, lighting layer 13, inducing layer 14, back electrode layer 15 and insulating layer 16 are sequentially overlaid on the substrate 11. The front and back electrode layers 12, 15 and the conductive layer 17 respectively have three outward extending conductive terminals 121, 151, 171 for connecting with a driving circuit 2. A conductive layer 17 is laid between the lighting layer 13 and the inducing layer 14. In this embodiment, the conductive layer 17 is laid along one side of the inducing layer 14 without affecting the light-emitting region of the lighting layer 13. The conductive layer 17 is connected to the grounding electrode 21 of the driving circuit 2, whereby the conductive layer 17 can conduct the charge accumulating on the inducing layer.

The conductive layer 17 can be made of conductive material such as silver gum, carbon gum, metal and conductive polymer. The less the surface resistance is, the better the conduction effect is.

The EL cell can be deemed a capacitor sheet. Therefore, when the driving circuit applies AC voltage between the front electrode layer 12 and the back electrode layer 15 for driving the lighting layer 13 to emit light, due to EMI effect, the charge will accumulate on the inducing layer 14 to create surface energy conservation effect. The surface energy conservation effect will make the charge uneven distribute on the inducing layer 14 and create piezoelectric effect. The piezoelectric effect will lead to vibration of the EL cell to emit noise.

The conductive layer 17 of the present invention is made of

conductive material such as silver gum, carbon gum, metal and conductive polymer which is able to conduct the charge. In addition, the conductive layer 17 is connected to the grounding electrode of the driving circuit 2. Therefore, the charge accumulating on the inducing layer 14 can be quickly conducted to the grounding electrode to weaken the piezoelectric effect caused by the unevenly distributed charge and minify or even eliminate the vibration and noise.

It is shown according to the data of an actual test of this applicant that the noise caused by the EMI effect of the conventional EL cell without the conductive member can be heard by human ears. In contrast, human ears can hardly hear the noise emitted by the EL cell of the present invention. Therefore, the muffling effect of the present invention is apparent.

The above embodiment is only used to illustrate the present invention, not intended to limit the scope thereof. Many modifications of the above embodiment can be made without departing from the spirit of the present invention. Fig. 4 shows a second embodiment of the present invention, in which the conductive layer 37 extends to two adjacent sides of the inducing layer 14. Fig. 5 shows a third embodiment of the present invention, in which the conductive layer 47 extends to three adjacent sides of the inducing layer. These can achieve the same effect as the first embodiment.